Title Effects of organic, biological and conventional production methods on apple antioxidant levels, sensory qualities and human glycemic response

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Abstract

Different cultivation systems of fruit trees may influence fruit nutrient and phytochemical content, and consequently human responses. 'Braeburn' (*M. domestica*) apples grown in Washington state in 2007 under biologically-enhanced organic and conventional methods were evaluated for antioxidant properties . Treatments were split to include apples from the outside and inside of the tree canopies. There were no differences ($P > 0.05$) in ABTS or DPPH antioxidant activity between organic and conventional 'Braeburn' apples. Organic 'Braeburn' apples had a higher level ($P = 0.003$) of total phenolics (TP) than the conventional apples. Outside canopy apples had higher TP, ABTS and DPPH antioxidant activity levels ($P < 0.01$) than inside canopy apples. Organically-grown 'Braeburn' apples from both outside and inside the canopies had higher soluble solids levels ($P < 0.001$) than those conventionally-grown. Fruit soluble solids content was higher ($P = 0.002$) in 'Braeburn' apples from outside the canopy. The 'Braeburn' overall acceptability sensory ratings for organic apples were significantly higher ($P < 0.001$), than conventional fruits, and outside canopy fruits surpassed inside canopy fruits ($P < 0.001$). 'Crimson Gala' (*M. domestica*) apples from Washington state orchards grown under biologically-enhanced conventional management and typical conventional management were evaluated in 2008. The biological apples had higher ABTS antioxidant activity than the conventional ($P = 0.0498$). The conventional 'Gala' apples had higher DPPH antioxidant activity ($P = 0.002$) than the biological. There was no difference ($P = 0.681$) between the biological and conventional 'Gala' apple total phenolics (TP) levels. None of the values used to compare human glycemic response were statistically different ($P > 0.05$). The conventionally-grown 'Gala' apples had higher soluble solids levels ($P = 0.005$), greater shelf life ($P = 0.035$), and a higher overall sensory rating ($P = 0.014$) than the biologically-grown fruit. The above measured values were also correlated with soil, leaf, and fruit tissue values. It should be noted that the biological 'Gala' orchard had a soil with a cation exchange capacity (CEC) of 7.1 meq/100g compared to the conventional control orchard's CEC of 11.3 meq/100g, which may have negatively affected the quality of the biological apples.